

WHAT IS CLAIMED IS:

1. A frequency translating device (FTD) that utilizes a local oscillator (LO) to convert a radio frequency (RF) to an intermediate frequency (IF) and to convert an IF to a RF, said FTD comprising:

means for controlling variations in capacitance of said FTD to produce a reciprocal conversion response between said down-conversion and said up-conversion, said means for controlling variations in capacitance of said FTD including:

at least one light-activated resistor (LAR) connected to down-convert an RF to an IF and to up-convert an IF to an RF; and

a source of modulated light that is optically connected to said at least one LAR, said source of modulated light generating modulated light that is related to said LO, said at least one LAR being activated in response to said modulated light from said modulated light source.

2. The FTD of claim 1 wherein said modulated light source includes a light source that is directly modulated by said LO.

3. The FTD of claim 1 wherein said modulated light source includes a light source and a transmission switch that transmits or blocks transmission of light in response to said LO.

4. The FTD of claim 1 wherein said modulated light source includes a light source and a light path switch, wherein said light path switch is modulated by said LO.

5. The FTD of claim 1 further including a second LAR connected to down-convert an RF to an IF and to up-convert an IF to an RF, said second LAR being optically connected to said source of modulated light.

6. The FTD of claim 5 wherein said modulated light source includes a light source and a light path switch that is optically connected to said at least one LAR and to said second LAR.

5 7. The FTD of claim 1 further including second, third, and fourth LARs connected to down-convert an RF to an IF and to up-convert an IF to an RF, said second, third, and fourth LARs being optically connected to said source of modulated light.

10 8. The FTD of claim 7 wherein said modulated light source includes a light source and a light path switch that is optically connected to said at least one LAR, said second, said third, and said fourth LARs, wherein said light path switch is modulated by said LO.

9. A method for operating a frequency translating device (FTD), said method comprising:

providing modulated light to at least one light-activated resistor (LAR) that is modulated in response to a local oscillator (LO);

5 down-converting a radio frequency (RF) to an intermediate frequency (IF) using said at least one LAR, said down-conversion having a down-conversion response; and

up-converting an IF to an RF using said at least one LAR, said up-conversion having an up-conversion response;

10 wherein variations in capacitance of said at least one LAR are controlled during said down-conversion and said up-conversion to make said down-conversion response reciprocal to said up-conversion response.

10. The method of claim 9 wherein said step of providing modulated light
15 includes a step of directly modulating a light source with said LO.

11. The method of claim 9 wherein said step of providing modulated light includes a step of modulating a transmission switch with said LO.

20 12. The method of claim 9 wherein said step of providing modulated light includes a step of switching light between at least two transmission paths in response to said LO.

25 13. The method of claim 9 wherein said FTD is used for down-conversion and up-conversion in a three-pair measurement method.

14. A system for determining the conversion response of a device under test (DUT), the DUT is a frequency translation device (FTD), the system comprising:

means for coupling the DUT to a first test FTD (TM1) during a first measurement, for coupling said DUT to a second test FTD (TM2) during a second measurement, and for coupling said TM1 to said TM2 during a third measurement, said TM1 and TM2 are FTDs, said first measurement provides a first conversion response of said DUT coupled with said TM1 with one of the coupled DUT and TM1 being an up-converter FTD and the other one of said coupled DUT and TM1 being a down-converter FTD, said second measurement provides a second conversion response of said DUT coupled to said TM2 with one of said coupled DUT and TM2 being an up-converter FTD and the other one of said coupled DUT and TM2 being a down-converter FTD, the third measurement provides a third conversion response of said TM1 coupled with said TM2 with one of said coupled TM1 and TM2 being an up-converter FTD and the other one of said coupled TM1 and TM2 being a down-converter FTD, one of said TM1 FTD and TM2 FTD has reciprocal up-conversion and down-conversion responses, said reciprocal FTD is an up-converter during one of said first, second, or third measurements and is a down-converter during another one of said first, second, or third measurements, said reciprocal FTD including;

means for controlling variations in capacitance of said reciprocal FTD to produce said reciprocal conversion response between said down-conversion and said up-conversion, said means for controlling variations in capacitance of said reciprocal FTD including;

at least one light-activated resistor (LAR) connected to down-convert and to up-convert; and

a source of modulated light that is optically connected to said at least one LAR, said source of modulated light generating modulated light that is related to a local oscillator (LO), said at least one LAR being activated in response to said modulated light from said modulated light source;

an analyzer for measuring said first, second, and third measurements by providing an input signal at a first connection and by sampling an output signal from a second connection; and

a controller for calculating the conversion response of said DUT from said first, second, and third conversion responses.

15. The system of claim 14 wherein said modulated light source includes a light source and a transmission switch that transmits or blocks transmission of light in response to said LO.

16. The system of claim 14 further including an LO source for providing said LO to said source of modulated light.

17. The system of claim 14 further including a second LAR connected to down-convert an RF to an IF and to up-convert an IF to an RF, said second LAR being optically connected to said source of modulated light.

18. The system of claim 17 wherein said modulated light source includes a light source and a light path switch that is optically connected to said at least one LAR and to said second LAR.

19. The system of claim 14 further including second, third, and fourth LARs connected to down-convert an RF to an IF and to up-convert an IF to an RF, said second, third, and fourth LARs being optically connected to said source of modulated light.

20. The system of claim 19 wherein said modulated light source includes a light source and a light path switch that is optically connected to said at least one LAR, said second, said third, and said fourth LARs, wherein said light path switch is modulated by said LO.

21. The system of claim 14 wherein said analyzer includes means for measuring said first, second, and third conversion responses by providing an input signal at said first connection and by sampling the output signal at said second connection, for repeating said first measurement with said LO used by said source of modulated light phase shifted ninety degrees to provide a first repeated conversion response, for repeating said second measurement with said LO of one of the up or down converters phase shifted ninety degrees to provide a second repeated conversion response, and for repeating said third measurement with said LO used by said source of modulated light phase shifted ninety degrees to provide a third repeated conversion response, said reciprocal FTD is an up-converter during one of said first, second, or third measurements and respectively during said first, second, or third repeated measurements and is a down-converter during another one of said first, second, or third measurements and respectively during said first, second, or third repeated measurements; and

wherein said controller includes means for calculating the conversion response of said DUT from said first, second, and third conversion responses and said first, second, and third repeated conversion responses.

22. A method for determining the conversion response of a device under test (DUT), the DUT is a frequency translation device (FTD), the method comprising:

measuring a first conversion response of said DUT coupled with a first test device (TM1), said TM1 is an FTD, one of said coupled DUT and TM1 is an up-converter FTD and the other one of said coupled DUT and TM1 is a down-converter FTD;

measuring a second conversion response of said DUT coupled with a second test device (TM2), said TM2 is an FTD, one of said coupled DUT and TM2 is an up-converter FTD and the other one of said coupled DUT and TM2 is a down-converter FTD;

measuring a third conversion response of said TM1 coupled with said TM2, one of said coupled TM1 and TM2 is an up-converter FTD and the other one of said coupled TM1 and TM2 is a down-converter FTD, one of said TM1 FTD and TM2 FTD has reciprocal up-conversion and down-conversion responses, said reciprocal FTD is an up-converter during one of said first, second, or third measurements and is a down-converter during another one of said first, second, or third measurements, said reciprocal FTD including at least one light-activated resistor (LAR), wherein operation of said reciprocal FTD includes;

providing modulated light to said at least one LAR that is modulated in response to a local oscillator (LO), wherein variations in capacitance of said at least one LAR are controlled to make said down-conversion response reciprocal to said up-conversion response; and
calculating the conversion response of said DUT from said first, second, and third conversion responses.

23. The method of claim 22 wherein said step of providing modulated light includes a step of directly modulating a light source with said LO.

24. The method of claim 22 wherein said step of providing modulated light includes a step of modulating a transmission switch with said LO.

25. The method of claim 22 wherein said step of providing modulated light includes a step of switching light between at least two transmission paths in response to said LO.

5 26. The method of claim 22 comprising:

repeating said first measurement with said LO used to provide said modulated light phase shifted ninety degrees to provide a first repeated conversion response;

repeating said second measurement with said LO of one of said up or down converters phase shifted ninety degrees to provide a second repeated conversion
10 response;

repeating said third measurement with said LO used to provide said modulated light phase shifted ninety degrees to provide a third repeated conversion response, said reciprocal FTD is an up-converter during one of said first, second, or third measurements and respective first, second, or third repeated measurements and is a
15 down-converter during another one of said first, second, or third measurements and respective first, second, or third repeated measurements; and

calculating the conversion response of said DUT from said first, second, and third conversion responses and said first, second, and third repeated conversion responses.

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